

Ocean Acidification: The Biggest Threat to Our Oceans?

ADRIENNE FROELICH SPONBERG

When it comes to the oceans and carbon dioxide, there's good news and bad news. To date, the world's oceans have absorbed nearly a third of the excess carbon dioxide emitted as a result of anthropogenic activities. That may be good news for the atmosphere, but scientists and policymakers are increasingly concerned about the side effect of carbon dioxide absorption: ocean acidification.

Since the industrial revolution, ocean pH has gone down by 0.1 units, which translates into a 30 percent surge in acidity. Scientists predict that pH will go down another 0.14 to 0.35 units by the end of this century. Accompanying the lower pH are lower saturation points of minerals such as calcium carbonate, the primary skeletal material of marine organisms that form the basis of ocean food webs, such as phytoplankton and coral reefs. As the ocean becomes more acidic, calcium carbonate begins to dissolve. The shift in ocean chemistry is so profound that the shells will literally dissolve off the backs of some organisms under the ocean conditions predicted for 2100, according to experiments conducted by Victoria Fabry, of California State University in San Marcos.

The rapid change in seawater acidity is almost unprecedented. At a Senate Oceans, Atmosphere, Fisheries, and Coast Guard Subcommittee hearing on ocean acidification, Scott Doney, of Woods Hole Oceanographic Institute, testified, "Marine life has survived large climate and acidification variations in the past, but the projected rates of climate change and ocean acidification over the next century are much faster than experienced by the planet in the

past, except for rare, catastrophic events in the geological record." Thomas Lovejoy, president of the Heinz Center for Science, Economics and the Environment, shares Doney's concern. Lovejoy has described ocean acidification as "the most profound environmental change I have observed in my entire professional career."

Unlike the situation with other aspects of climate change, there is no controversy over ocean acidification. At the Senate hearing on ocean acidification, the panelists universally painted a grim picture. Not only will species have to adapt to a changing thermal environment, but they will also have to cope with increased acidity of seawater. David Conover, dean and director of the Marine Science Research Center at Stony Brook University, warned the subcommittee that the combination of stresses will make commercial species less resilient to harvesting: "We may need to reduce [the] harvest [of] some species in certain areas to enable them to withstand the additional stress."

Further complicating matters are potential shifts in marine community structure. David Hutchins, a professor at the University of Southern California, has conducted experiments in open ocean areas to determine how plankton communities will react to the higher temperature and greater acidity of oceans of the future. His team's results suggest a shift in marine food webs "that will make the ocean much less productive of resources like fish that a hungry human population depends on."

Scientists concede there are many unknowns regarding ocean acidification. As with other aspects of climate

change, scientists need to refine models of the physical environment. But even with improved physical models, Doney says, "significant knowledge gaps" in ocean biology will hinder "the creation of the skillful forecasts needed to guide ocean management decisions."

Despite the knowledge gaps, there is no dedicated federal funding for ocean acidification research. Some members of Congress want to change that. Senators Frank Lautenberg (D-NJ) and Maria Cantwell (D-WA) have introduced S. 1581, the Federal Ocean Acidification Research and Monitoring Act of 2007, to create an interagency task force for ocean acidification, as well as a research program to be housed at NOAA. Lautenberg says the bill's time has come: "Congress has been hearing from our Nation[']s experts on ocean acidification since 2004. Now is the time for national investment in a coordinated program of research and monitoring."

Although ocean acidification is relatively new on the policy radar screen, do not be surprised to see it jump the queue to the top of marine conservation issues. Cantwell, who chairs the Senate subcommittee with jurisdiction over ocean issues, sees acidification as a "must address" issue: "If we fail to address the potential impact of global climate change and ocean acidification, we may be jeopardizing all of our hard-fought ocean conservation gains."

Adrienne Froelich Sponberg (e-mail: asponberg@aslo.org) is director of public affairs at the American Society of Limnology and Oceanography.

doi:10.1641/B571004

Include this information when citing this material.